

South Carolina Central Cancer Registry
South Carolina Department of Health and Environmental Control

Cancer Assessment for
Zip Codes 29053 (Gaston, SC) and 29160 (Swansea, SC)

BACKGROUND

The South Carolina Central Cancer Registry (SCCCR) at the South Carolina Department of Health and Environmental Control (DHEC) has been the point of contact for community cancer concerns since 1999. The SCCCR follows the protocol: *Guidelines for Investigating Clustering of Health Events*, established by the Centers for Disease Control and Prevention (CDC).[1] Further, the ‘SCCCR Protocol for Handling Cancer Cluster Investigations’ has been utilized in national training programs for state cancer registries.

Newly diagnosed cases of cancer occurring in South Carolina residents are included in the SCCCR, a population-based cancer registry established in 1993. State legislation was passed in 1996 mandating cancer reporting from all healthcare providers in the state beginning that year.

Cancer incidence data available for this assessment include cases diagnosed from 1996 to 2000. It is noteworthy that the North American Association of Central Cancer Registries has certified the SCCCR data for this time period by national standards for completeness, timeliness, and quality. [2] Therefore, the data are considered to be credible and of high quality for utilization for community cancer assessments. The cancer mortality data available for this cancer assessment include the five-year period from 1997 to 2001.

METHODS

CDC advocates a systematic four-stage approach for responding to reports of clusters of adverse health events. Stages 1 and 2 of the CDC protocol include case validation and assessment. [1] In compliance with these steps, the SCCCR determines the number of new cases, and cancer deaths, observed and expected within the geographic area of concern, and for the time period of interest. Statistical analyses (i.e. observed/expected ratios and Chi-square tests) are next performed by type of cancer. The ‘expected’ numbers of cancer cases and cancer deaths are calculated using the 2000 Census population data and the most recent age-specific cancer incidence and mortality rates for South Carolina. The following procedural and analytic steps are completed:

1. The cancer cases and cancer deaths that occurred in the Zip Codes of concern are obtained from DHEC’s cancer registry and vital registry data. [3,4,5] All cases are validated through their respective quality control procedures.
2. The numbers of observed cases and deaths for the referent area are determined.

3. The observed/expected case ratios for each type of cancer are calculated.
4. Chi-square statistics for each cancer type are calculated. These are tests of the difference of the observed number, from that expected as being the result of random variation.
5. The results of these calculations are inspected to identify any unusual patterns of cancer types within the geographic area of concern.
6. The results of this assessment are communicated verbally and in writing, to the contact person in the community, or the requestor of the information. The DHEC Health District Director and the DHEC Health Hazards Community Liaison are also copied. A record of the findings and recommendations is filed and is provided for review by the DHEC Cancer Cluster Advisory Team at its semi-annual meeting.

With the investigation in of cancer risk in Gaston and Swansea, the number of new cancer cases diagnosed from 1996 through 2000 were assessed for Zip Codes 29053 and 29160. A data set of the newly diagnosed cases from the cancer registry for years 1996 through 2000 from these areas was created. Using the SAS statistical software, the data set was analyzed as described above, using the observed/expected ratios for each type of cancer that occurred during this period, in these Zip Codes. The respective Chi-square statistics were derived to assess evidence of a statistically significant finding, that is more cases or deaths observed than expected. The criterion for declaring statistical significance was the conventional $p < 0.05$ level.

The number of cancer deaths occurring from 1997 through 2001 was then similarly assessed for these Zip C codes. The same process used to analyze new cancer cases was applied to analyze cancer deaths.

RESULTS

Assessment for Zip Code 29053

Cancer Cases: Table 1 presents the findings for cancers that occurred in Zip Code 29053 from 1996-2000. Also shown is the number of cancer cases that were expected. A total of 235 new cases of cancer occurred , while 246 cases were expected to occur based on statewide rates. Therefore the absence of statistical significance declares that no excess of overall cancer cases occurred for this Zip Code during this time period. Over all but one of the cancer sites shown, the interpretation is just the same. The analysis revealed one specific type of cancer, lung cancer, to be significantly higher than expected. A total of 55 lung cancer cases occurred; 37 were expected. Of the total lung cancer cases, 48 (87%) occurred in persons ages 55 years and older. A total of 31 lung cancer cases (56%) were male, 24 (44%) were female; 50 (91%) were white, and (69%) were diagnosed in late stage of disease. These proportions were described in order to compare the distribution of lung cancer cases to those already established for the disease, or based on the attribute distributions for the Zip Code population. Risk factors for lung cancer are discussed later in this report.

Cancer Deaths: Table 2 describes the number of cancer deaths that occurred and the number expected in the Zip Code. A total of 102 cancer deaths occurred in this Zip Code, while 104 deaths were expected. Therefore, no statistical evidence was found to declare that an excess of overall cancer deaths occurred.

Assessment for Zip Code 29160

Cancer Cases: In the same manner as before, Table 3 depicts the finding from this standard analysis for the types of cancers that occurred in Zip Code 29160 from 1996-2000. Again shown are the number of cancer cases expected based upon the statewide rates. A total of 135 new cases of cancer occurred in the zip code, while 145 cases were expected. The analysis did not reveal any specific types of cancer that were shown to be statistically significantly higher than expected, nor were the overall number of cancers elevated.

Cancer Deaths: Table 4 presents the number of cancer deaths that occurred and the number expected in the corresponding manner as described above. A total of 65 cancer deaths occurred in this Zip Code, while 66 deaths were expected based upon statewide cause-specific mortality rates. The analyses again did not reveal any specific types of cancer where the number of deaths was statistically significantly greater than expected.

DISCUSSION

The number of lung cancer cases and lung cancer deaths observed in Zip Code 29053 were found to be statistically significantly greater than expected. Lung cancer is one of the most commonly occurring cancers in South Carolina and is the leading cause of death due to cancer in the state. Overwhelmingly, the most important risk factor for lung cancer is cigarette smoking. More than 80% of lung cancers are thought to result from cigarette smoking. [6] It is also reported that smoking rates in South Carolina are high relative to the national average based upon national prevalence surveys conducted by CDC. [7] Hospitals reporting these lung cancer cases to the SCCCR recorded that 42 (76%) of the 55 cases were either current or past tobacco users. It is relevant to the finding of excess lung cancers and corresponding cause-specific deaths that the 5-year survival rate for lung cancer is very low, 15%. This dismal prognosis is primarily due to the fact that the majority of lung cancers are diagnosed in advanced stages of disease. SCCCR data show that 69% of the lung cancer cases in this Zip Code were diagnosed at an advanced stage of disease.

There are other factors that can increase a person's risk of developing lung cancer. Exposure to second-hand smoke, occupational exposure to asbestos and radon may increase a person's risk. Other exposures to cancer-causing agents in the workplace, such as uranium, arsenic, vinyl chloride, nickel chromates, coal products, fuels, and diesel exhaust increase lung cancer risk. In addition, recurring respiratory system inflammation (i.e. from tuberculosis or pneumonia) may leave scarring on the lungs increasing the risk of developing lung cancer. If

workplace exposure should be a concern from these findings, and it is warranted by the data, the SCCCR Protocol includes a mechanism for referral of the investigation to the National Institute for Occupational Safety and Health; this is the federal agency responsible for workplace health assessments.

CONCLUSIONS

Zip Code 29053

In order for a true cancer cluster to exist, the number of cancers occurring must be more than would be expected to occur by chance. The epidemiologic rule-of-thumb is that at least a three-fold increase is necessary to “sound the alert” for a potential cancer cluster, as reported in a recently published scientific article.[8] Along with statistical testing, there are several other criteria utilized to determine if a so called ‘true’ cancer cluster exists. First, a cancer cluster would more likely involve rarer types of cancer rather than more common cancers like lung, breast, or colon cancers. Also, the cases could be expected to be clustered within a short time interval or over a narrow age-range.

In Zip Code 29053, fewer cancer cases and cancer deaths occurred than were expected. Lung cancer cases and deaths were significantly elevated in this Zip Code. However, there is no statistical evidence of cancer clustering here. Lung cancer is one of the most commonly occurring cancers in this state, surpassed only by prostate cancer. There was a 1.5-fold increase of the lung cancer cases. The lung cancers were not clustered in time; there was a consistent occurrence of lung cancer cases and deaths annually across the time period. Further, the primary risk factor associated with lung cancer is lifestyle-related (i.e. smoking), and the majority (76%), of the lung cancer cases in this Zip Code were either current or past tobacco users according to the SCCCR data. The age distribution of the lung cancer cases is very compatible with the national and state distributions, as are the stage at diagnosis proportions. The racial distribution for the lung cancers is compatible with those of the county. After weighing this evidence and evaluating the conventional (e.g., published) criteria for determining clustering of health events, this office declared that there is no evidence of cancer clustering in Zip Code 29053.

Zip Code 29160

Fewer cancer cases and cancer deaths occurred in Zip Code 29160 than expected. There were no sites of cancer that were statistically significantly elevated for either cases or deaths. Therefore, again, this office declared that there is no evidence of cancer clustering in Zip Code 29160.

Table 1. Analysis of New Cancer Cases in Zip Code 29053, 1996-2000

<u>Site</u>	<u>Observed No. of Cases</u>	<u>Expected No. of Cases</u>	<u>Observed/Expected</u>	<u>Chi-SquareTest*</u>
Lung/Bronchus	55	36.7	1.50	9.18
Breast (Female)	29	39.0	0.74	2.56
Colon/Rectum	27	26.3	1.03	0.02
Prostate	21	37.5	0.56	7.26
Non-Hodgkins Lymphoma	13	8.2	1.59	2.82
Bladder	11	8.6	1.28	0.66
Melanoma	8	10.1	0.79	0.43
Kidney/Renal Pelvis	6	6.5	0.93	0.03
Oral/Pharynx	6	7.7	0.78	0.37
Leukemia	5	5.0	1.00	0.00
Pancreas	<5	**	**	**
Uterus	<5	**	**	**
All Sites	235	246.1	0.96	0.50

Excludes in situ cases of cancer to allow for comparison.

**Cancer sites with less than 5 cases observed are not shown due to SCCCCR confidentiality rules ;

Cancer sites with less than 5 cases expected are not analyzed due to unreliability of statistical tests based on small numbers

*The Chi-square statistical test allows us to determine if the difference between what is observed and what is expected is significant. If the value is greater than 3.84, then we are 95% confident that the observed number of cases is significantly different from the expected number of cases.

Prepared by: SC Central Cancer Registry, Office of Public Health Statistics and Information Services, Department of Health and Environmental Control, 2600 Bull St., Columbia, SC 29201

January 28, 2004 lcs

Table 2. Analysis of Cancer Deaths in Zip Code 29053, 1997-2001

<u>Site</u>	<u>Observed No. of Deaths</u>	<u>Expected No. of Deaths</u>	<u>Observed/Expected</u>	<u>Chi-SquareTest*</u>
Lung/Bronchus	51	30.8	1.66	13.25
Colon/Rectum	10	9.9	1.01	0.00
Pancreas	4	5.5	0.73	0.41
Breast (Female)	<5	**	**	**
Prostate	<5	**	**	**
All Sites	102	104.3	0.98	0.05

**Cancer sites with less than 5 cases observed are not shown due to SCCCCR confidentiality rules ;

Cancer sites with less than 5 cancer deaths expected are not analyzed due to the unreliability of statistical tests based on small numbers.

*The Chi-square statistical test allows us to determine if the difference between what is observed and what is expected is significant. If the value is greater than 3.84, then we are 95% confident that the observed number of deaths is significantly different from the expected number of deaths.

Prepared by: SC Central Cancer Registry, Office of Public Health Statistics and Information Services, Department of Health

Table 3. Analysis of New Cancer Cases in Zip Code 29160, 1996-2000

<u>Site</u>	<u>Observed No. of Cases</u>	<u>Expected No. of Cases</u>	<u>Observed/Expected</u>	<u>Chi-SquareTest*</u>
Lung/Bronchus	23	22.8	1.01	0.00
Breast (Female)	17	22.3	0.76	1.27
Colon/Rectum	17	16.4	1.04	0.02
Prostate	17	23.3	0.73	1.68
Bladder	9	5.5	1.62	2.15
Melanoma	<5	**	**	**
Non-Hodgkins Lymphoma	<5	**	**	**
All Sites	135	145.4	0.93	0.74

Excludes in situ cases of cancer to allow for comparison.

** Cancer sites with less than 5 cases of cancer observed are not shown due to SCCR confidentiality rules

Cancer sites with less than 5 cases of cancer expected are not analyzed due to the unreliability of statistical tests based on small numbers.

*The Chi-square statistical test allows us to determine if the difference between what is observed and what is expected is significant. If the value is greater than 3.84, then we are 95% confident that the observed number of cases is significantly different from the expected number of cases.

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January 28, 2004 lcs

Table 4. Analysis of Cancer Deaths in Zip Code 29160, 1997-2001

<u>Site</u>	<u>Observed No. of Deaths</u>	<u>Expected No. of Deaths</u>	<u>Observed/Expected</u>	<u>Chi-SquareTest*</u>
Lung/Bronchus	19	19.6	0.97	0.02
Colon/Rectum	<5	**	**	**
Breast (Female)	<5	**	**	**
All Sites	65	66.0	0.98	0.02

** Cancer sites with less than 5 cancer deaths observed are not shown due to SCCR confidentiality rules

Cancer sites with less than 5 cancer deaths expected are not analyzed due to the unreliability of statistical tests based on small numbers.

*The Chi-square statistical test allows us to determine if the difference between what is observed and what is expected is significant. If the value is greater than 3.84, then we are 95% confident that the observed number of deaths is significantly different from the expected number of deaths.

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January 28, 2004 lcs

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February 2, 2004